QE March 23, 2001

TO: M/Associate Administrator for Space Flight

FROM: Q/Associate Administrator for Safety and Mission Assurance

SUBJECT: Safety and Mission Assurance (SMA) Processes for Human Space Flight

The Office of Safety and Mission Assurance has been working with the Agency SMA community to improve SMA processes for human space flight programs. The enclosure, "Safety and Mission Assurance (SMA) Processes for Human Space Flight," represents the results of this effort. Enhancements to SMA processes have been highlighted with a yellow background in the enclosure. Although not all of the enhancements are in place today, my goal is for the SMA community to provide this level of support to the Human Exploration and Development of Space Enterprise.

We will begin immediately to implement the SMA processes outlined in the enclosure. Each SMA organization should strive to implement the process enhancements and fulfill the roles and responsibilities described in this document.

If you have any questions concerning the enclosed document, please call me, William Hill at (202) 358-0571, or Richard Patrican at (202) 358-0569.

/s/
Frederick D. Gregory

Enclosure

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QS01/Ms. Goodson
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QE-HEDS-01-01
Safety and Mission Assurance (SMA) Processes
For
Human Space Flight Missions

Introduction:

The Human Exploration and Development of Space (HEDS) Enterprise Safety and Mission Assurance (SMA) community is an active stakeholder in the safe and successful performance of human space flight activities. Led by the Office of Safety and Mission Assurance (OSMA), the HEDS SMA community provides critical in-line (NASA/contractor) safety, reliability, and quality products and services directly to the HEDS programs and projects. These products and services are primarily the results of SMA studies, analyses, and risk assessments and provide the basis for SMA decisions. In addition to in-line products and services, program/project contractor surveillance, oversight of SMA processes, and independent technical assessments are necessary inputs to formulate SMA decisions. For each human space flight mission, the HEDS SMA community provides input and recommendations through the HEDS SMA flight readiness process to support the formal Certification of Flight Readiness (CoFR) process. The HEDS Assurance Board (HAB), established to provide the SMA community an opportunity to assess the nonmission-specific safety and risk management of the HEDS programs, assesses all aspects of the HEDS Enterprise.

Purpose:

This document outlines the requirements, roles, and responsibilities of the HEDS SMA community in assuring the safety and mission success of human space flight programs. The overarching goal of HEDS SMA community processes is to protect the public, astronauts and pilots, NASA workforce, and high-value equipment and property. This document is limited in discussion to processes which have a direct interface with the OSMA, including the formal CoFR process, HEDS Assurance Board, Process Verification, Annual Operating Agreement, Independent Assessment, and the SMA processes supporting the launch, mission execution, and recovery activities. This document addresses these activities as they apply specifically to the Space Shuttle and the International Space Station (ISS) programs.

The purpose of this document is to delineate the HEDS SMA processes that are employed to:

1. Implement NASA Policy Directive (NPD) 8700.1, “NASA Policy for Safety and Mission Success,” in the conduct of human space flight programs through

independent SMA analysis, evaluation efforts, and critical in-line SMA surveillance activities.

2. Ascertain the collective readiness of the entire HEDS SMA community in an independent manner, including Civil Service and contractor staff, as the foundation for the SMA decision to proceed to launch, execute the mission, sustain on-orbit operations, and return the crew safely to Earth.

3. Provide an alternative independent communications path to senior NASA management for issues and concerns that potentially affect flight and ground safety and the ability to meet minimum mission success criteria.

4. Evaluate the effectiveness of HEDS SMA community activities, specifically in preparation for the launch or the next mission phase.

5. Assess, as needed in near-real time, unplanned or potential contingency events that occur during human space flight missions or during preflight processing.

Practices:

1. The HEDS SMA community decisions are based on risk assessments, independent studies and analyses, validation efforts, audits, completion of required work, and surveillance of contractor efforts. The HEDS SMA community assures that all flight and ground safety requirements have been achieved and that issues and concerns that adversely affect meeting the minimum mission success criteria have been appropriately dispositioned.

2. The HAB assesses any aspect of the HEDS Enterprise. It provides ongoing, nonmission-specific assessment of safety and risk management for each human space flight program and the Enterprise as a whole.

3. Overall verification of HEDS Enterprise SMA compliance with NASA policy is determined through ongoing SMA oversight and assessment activities conducted by the OSMA.

Expectations:

NASA organizations specifically assigned to the various SMA tasks are expected to encourage open communications, accomplish and verify performance in their area of responsibility, and involve senior SMA management in SMA processes. Specifically, each review forum conducted by the OSMA to evaluate flight readiness will meet the following expectations:

1. The senior SMA representative of each HEDS entity will be in attendance at each meeting. Organizations represented include the following:

   a. NASA HEDS Enterprise Centers and program SMA organizations. For Space Shuttle and ISS this includes NASA program/project in-line SMA

(direct/indirect) from Johnson Space Center (JSC), Marshall Space Flight Center (MSFC), Kennedy Space Center (KSC), and Stennis Space Center (SSC).

b. Prime contractor(s) SMA organizations for HEDS. For Space Shuttle and ISS this includes ISS Prime Contractor, major ISS subcontractors, SFOC Prime Contractor, major SFOC Subcontractors, and Shuttle Element Contractors.

c. Independent Assurance: HEDS Independent Safety and Mission Assurance, MSFC Independent Assessment & Integration Department, and KSC Safety, Health and Independent Assessment.

d. Headquarters: Office of Safety and Mission Assurance (OSMA).

e. Astronaut Office: Safety Branch Chief

2. In all SMA reviews, everyone in attendance is obligated to apply individual experience, knowledge, and wisdom in assessing the adequacy of problem closure and rationale to proceed.

3. At the discretion of senior SMA managers, the most knowledgeable individual(s) will be present to discuss key areas of emphasis. It is appropriate for senior SMA managers to invite non-SMA organizations/individuals to present information for consideration.

4. To make this process effective, communications must be professional in nature, open, and honest; with no fear of retribution or condemnation.

In all SMA reviews, each organizational entity will be provided the time needed to express facts, opinions, issues, and concerns. At the conclusion of the HEDS SMA flight readiness process, the Associate Administrator for Safety and Mission Assurance and other Certificate of Flight Readiness signatories will consider all input provided and will use that data and information in the formal CoFR decision making process. Participation in this process does not relieve any organizational entity from accountability in performing their assigned program/project responsibilities. In addition, the HEDS SMA flight readiness process is not a consensus-building process. Participants may arrive at different readiness positions and pursue alternate paths for resolution.

Functional Responsibilities:

1. Agency Safety and Mission Assurance. In accordance with NASA policy, the Associate Administrator for Safety and Mission Assurance is responsible for:

a) Terminating any operation that presents an immediate and unacceptable risk to personnel, property, or mission operations.

b) Ensuring that effective and efficient functional management is in place to enhance the potential for success of NASA programs, projects, and operations.

c) Ensuring that each Center has designated SMA functional managers, with a direct line of authority to the Center Director, and functional management reporting duties to the Associate Administrator for Safety and Mission Assurance, as part of an alternative, independent line of communications and functional supervision process for ensuring unrestricted flow of information and action concerning safety, risks, or other SMA matters to the appropriate levels of management.

d) Ensuring oversight and independent assessments are conducted to ascertain that appropriate risk management practices are used for the identification, documentation, evaluation, and disposition of all Safety, Reliability, Maintainability, and Quality (SRM&Q) risks for all programs, projects, and operations.

The Associate Administrator for Safety and Mission Assurance is specifically responsible for:

a) Chairing the SMA Prelaunch Assessment Review (PAR) process.

b) Participating as a member of the Flight Readiness Review Board chaired by the HEDS Lead Center Director.

c) Providing concurrence/nonconcurrence by signature on the readiness to proceed with the human space flight mission under consideration.

d) Chairing the HEDS Assurance Board (HAB).

e) Concurring in each NASA Center Annual Operating Agreement.

f) Concurring in the results of each Process Verification Review.

g) Implementing Mishap Reporting responsibilities per NPD 8621.1G, “NASA Mishap Reporting and Investigating Policy.”

2. HEDS SMA Oversight

The HEDS SMA oversight function assures compliance with NASA safety program policy, requirements, and guidelines as applied to human space flight programs and projects. The HEDS SMA oversight function also provides a means to identify, define, and assess significant ground and flight safety issues to provide NASA senior management with an understanding of high-risk areas, safety concerns, and quality problems. Additionally, the HEDS SMA oversight function focuses on activities and processes that defend against requirements creep. To accomplish this, the HEDS SMA oversight function organizes and

leads special teams of government and contractor experts to assess the safety and integrity of human space flight program plans, policies, guidelines, and procedures. The HEDS SMA oversight function participates as a member at safety reviews, design reviews, flight readiness reviews, operational readiness reviews, and flight acceptance readiness reviews, and provides a point of contact with HEDS Centers and contractors for human space flight programs and projects. The HEDS SMA oversight function also assures each Center SMA function has completed an Annual Operating Agreement with the Center Director on the activities to be performed.

3. HEDS Independent Assessment

The HEDS independent assessment function is responsible for technical independent assessment of selected SMA issues and concerns associated with Space Shuttle and ISS development, ground processing, and flight/on-orbit operations. The HEDS independent assessment function is responsible for looking beyond the near-term events in human space flight programs to assure that proper attention is being paid to the full scope of the program. Assessments being performed address a broad scope of human space flight program activities and are not necessarily mission specific. The HEDS independent assessment function investigates all avenues that could propagate into failure, e.g., communication, organization, etc. It identifies and assesses these areas and reports the results to the program and independently to the Associate Administrator for Safety and Mission Assurance through both mission-specific and nonmission-specific SMA forums.

4. NASA Space Shuttle SMA including Government Surveillance

The NASA Space Shuttle program SMA function (in-line SMA) is responsible for the requirements and oversight associated with overall SMA certification of flight readiness of all manifested systems and elements, including NASA-to-NASA Government-Furnished Equipment (GFE), that comprise the Space Shuttle. HEDS Center SMA organizations are responsible for assuring implementation and compliance with Space Shuttle program requirements. The NASA Space Shuttle SMA function is responsible for assuring that the contractor and GFE suppliers have executed all the necessary SMA analyses and activities to demonstrate compliance with programmatic and technical requirements and is the primary defense against requirements creep. These organizations are required to present evidence of work completion and to provide evidence of contractor compliance through surveillance (insight/oversight) as a part of the program/project CoFR process. In the SMA flight readiness process, NASA must demonstrate they have fulfilled program, Center, and Agency requirements and directives and identify shortfalls as exceptions.

5. NASA ISS SMA including Government Surveillance

The NASA ISS program SMA function (in-line SMA) is responsible for the requirements and oversight associated with overall SMA certification of flight

readiness of all manifested systems and elements. This includes NASA-to-NASA GFE and International Partner (IP) components launched to the ISS. HEDS Center SMA organizations are responsible for assuring implementation and compliance with ISS requirements. The NASA ISS SMA function is responsible for assuring that the contractor, IP, and GFE suppliers have executed all the necessary SMA analyses and activities to demonstrate compliance with programmatic and technical requirements. It is the primary defense against requirements creep. All organizations involved in NASA ISS SMA are required to present evidence of work completion and to provide evidence of contractor compliance through surveillance (insight/oversight) as a part of the program/project CoFR process. In the SMA flight readiness process, NASA must demonstrate they have fulfilled program, Center, and Agency requirements and directives and identify shortfalls as exceptions.

6. Contractor Safety and Mission Assurance

The contractor is responsible for certification of flight readiness of all applicable systems. The contractor is able to perform this certification by demonstrating completion of all assigned responsibilities, tasks, products, processes, and reviews for a particular flight in accordance with applicable program/project requirements. The contractor must provide full disclosure when discussing the performance of their technical and programmatic tasks. It is expected that the contractor's knowledge and experience will be applied to their products and services to assure the safety and success of the mission. In the SMA flight readiness process, the contractor, in conjunction with NASA, must demonstrate they have fulfilled program, Center, and Agency requirements and directives and identify shortfalls as exceptions.

7. SMA Program Integration

The SMA program integration function is responsible for integrating SMA risk assessment activities across the Space Shuttle and ISS programs. This function requires a high-level awareness of risk issues and concerns facing a program or the integration of programs to assure that appropriate attention and analysis of potential risks is performed in the SMA community. To support this function, a SMA flight manager will be assigned by the Associate Administrator for Safety and Mission Assurance upon establishment of a Space Shuttle mission by the Space Shuttle Program Requirements Control Board (PRCB). The SMA flight manager will track mission requirements and assure effective coordination of activities leading to the launch, mission execution, and recovery. The SMA program integration function is responsible for assuring communication and elevation of potential risk issues and concerns to program and SMA senior management. The SMA program integration function makes a single integrated presentation at Flight Readiness Reviews for Space Shuttle and Space Station missions. This presentation includes the readiness statement of the ISS and Space Shuttle SMA managers, HEDS SMA Center Directors, HEDS Independent Safety and Mission Assurance, KSC Safety, Health and Independent

Assessment, and the HEDS Enterprise SMA Division. This SMA readiness statement is jointly determined upon completion of the program CoFR and PAR processes. The SMA program integration function is responsible for representing OSMA and the SMA community and providing the SMA position on the Mission Management Team (MMT).

The SMA MMT member is responsible for monitoring and coordinating the evaluation of anomalies, issues, and concerns.

The SMA program integration function provides the coordination and administrative activities for all PAR's. This function shall provide the coordination of PAR meetings with the participants, including notification of meetings and the provision of agendas. A web site has been established to provide access to PAR presentation material and one-pagers; the SMA program integration function administers this web site. In addition, the administrative function assures that each PAR is voice recorded and the presentation materials are properly stored for historical purposes.

8. HEDS Assurance Board

The HEDS Assurance Board (HAB), chaired by the Associate Administrator for Safety and Mission Assurance, provides the forum necessary to proactively assess the SMA processes internal to the HEDS Enterprise, identify deficiencies, and make recommendations for correction. The HAB provides senior NASA management with timely, objective, nonadvocacy assessments of program risk, status, and relative safety posture of the HEDS Enterprise. Figure 1 depicts the membership of the HAB.

The HAB responsibilities include:

a. Assessing the work processes and overall effectiveness of the entire SMA community.
b. Reviewing HEDS programs to ensure that proper attention is being paid to risk.
c. Reviewing the overall effectiveness of the hardware, software, and operational aspects of the program to assure proper emphasis is being place on public safety, flight and ground crew safety, and on protection of assets in all HEDS Center activities to assure safety and mission success.

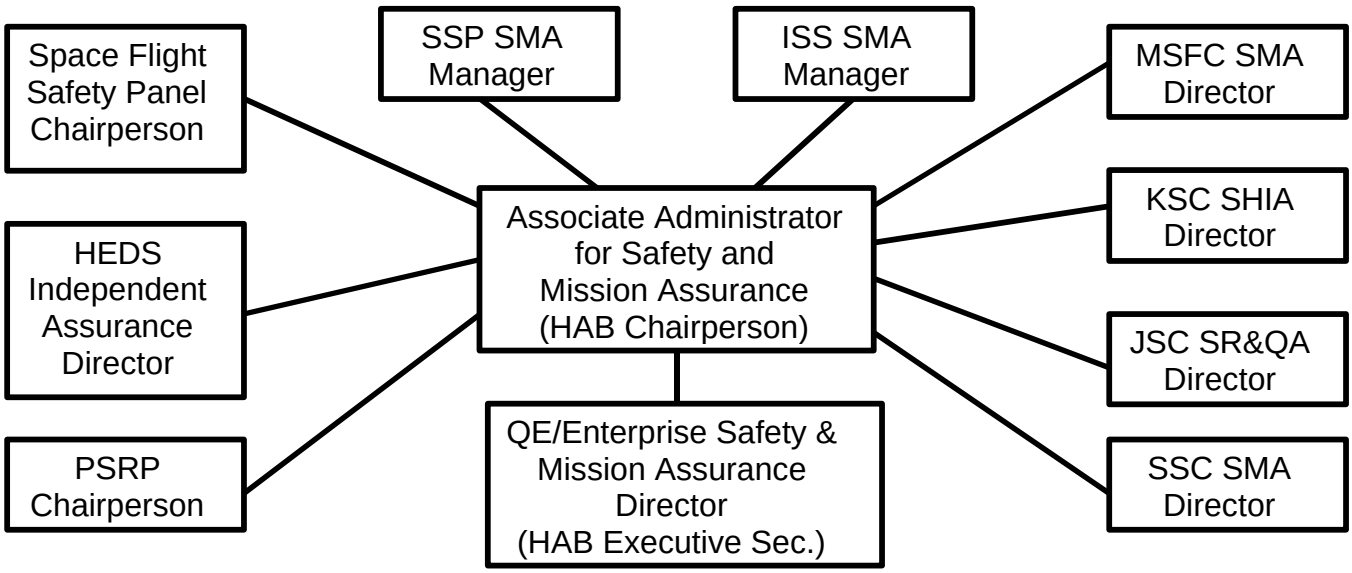

Figure 1 – HEDS Assurance Board Membership

Commit-to-Flight Review Process:

The commit-to-flight review process comprises a series of program reviews and readiness polls structured to allow NASA senior management to incrementally assess progress toward readiness for flight and mission execution. Each incremental review provides additional certification and verification of flight readiness. The final Flight Readiness Review (FRR) provides senior NASA management a summary of the certification and verification activities completed and rationale for acceptance of residual risk. The FRR process provides the mechanism for all NASA and contractor organizations contributing to the program(s) to certify/verify that the necessary tasks, activities, analyses, and data products associated with the endorsement statements have been accomplished and present a high probability of mission success. By signing the Certificate of Flight Readiness, NASA senior managers in attendance agree to the acceptance of the residual risks associated with mission execution.

Like other programmatic organizations at the FRR, the SMA community is required to attest to the successful completion of its activities and responsibilities. HEDS SMA organizations are responsible for the certification and verification of all SRM&Q tasks and products associated with a mission. In support of program requirements, the SMA organizations provide direct support to the SSP and ISS SMA managers and must verify their products at each incremental review. SSP and ISS SMA project manager certification shall be documented through project CoFR endorsements.

Upon satisfactorily verifying project-level SRM&Q task accomplishment, the program SMA manager certifies acceptance by signing the program Certificate of Flight Readiness. Program/project presentations at the program Flight Readiness Review

shall include sufficient information and supporting evidence to verify SRM&Q task completion.

The Associate Administrator for Safety and Mission Assurance utilizes information from the program, HEDS independent assessment function, oversight activities, and other sources to formulate a CoFR decision. The FRR agenda includes a specific "Safety and Mission Assurance" agenda item during which an OSMA representative presents the SMA position. This presentation reflects the various programs, HEDS independent assessment function, and oversight efforts used by OSMA to arrive at the CoFR position. The presentation summarizes all SMA activities conducted in support of the mission and serves as evidence of compliance with NPD 8700.1, "NASA Policy for Safety and Mission Success," by the OSMA, programs, and HEDS Center SMA organizations.

Formal Space Shuttle and ISS CoFR Process Overview:

The formal CoFR process culminates at the FRR. The FRR is an integrated senior management review chaired by the HEDS Lead Center Director and supported by a review board. It is a program requirement that the HEDS Lead Center Director make an assessment of mission readiness prior to each flight. This is accomplished by a comprehensive review of all activities/elements necessary for the safe and successful conduct of all operations from prelaunch through post-landing and recovery operations. Each program element certifies, through signature by the cognizant NASA and contractor senior management, that all required processes, products, and responsibilities are complete or will be completed prior to launch. The formal FRR Board is comprised of the Associate Administrator for Safety and Mission Assurance, the Associate Administrator for the prime mission (non-ISS missions), the Deputy Associate Administrator for Space Operations (Shuttle), HEDS Enterprise Center Directors, Space Shuttle Program Manager, and the program manager for the Space Flight Operations Contract. For ISS missions, the Deputy Associate Administrator for HEDS Development (Space Station) replaces the Associate Administrator for the prime mission, and the NASA ISS Program Manager and ISS prime contractor (Boeing) program manager are added to the board.

In preparation for the formal FRR and Certificate of Flight Readiness signature, each organization supporting the Space Shuttle launch, mission execution, and recovery conducts a flight preparation readiness process. Plans for the Space Shuttle program flight readiness process are contained in NSTS 08117, "Requirements and Procedures for Certification of Flight Readiness." Plans for the ISS program flight readiness process are contained in SSP 50108, "Certification of Flight Readiness Process Document." As applicable for each organization, the process plans document all major and critical operations (design, certification, analyses, tests, documentation, and requirement definition) for each mission. SMA organizations at each HEDS Center perform in-line responsibilities that directly support each Space Shuttle element and the ISS. In-line SMA process completion and products required to support each project/element are documented in the flight preparation plans found in NSTS 08117 (for Space Shuttle) and SSP 50108 (for ISS).

There are two additional flight preparation plans that specifically address SMA activities. NSTS 08117, Appendix Q, "Space Shuttle Safety, Reliability, and Quality Assurance Flight Preparation Plan," addresses the processes, activities, and products that each Center SMA organization provides to the Space Shuttle program and to the Associate Administrator for Safety and Mission Assurance through the existing PAR process. Independent assessments performed by the HEDS Independent Safety and Mission Assurance Office and the KSC Safety, Health and Independent Assessment Directorate are also addressed. NSTS 08117, Appendix S, "The Safety and Mission Assurance Flight Preparation Plan," addresses the audit and surveillance activities of the Space Flight Operations Contract performed by the Manager, Space Shuttle Program Safety and Mission Assurance.

SSP 50231, "Safety and Mission Assurance Certification of Flight Readiness Implementation Plan," defines the ISS SMA activities to satisfy the CoFR requirements defined in SSP 50108. Included are endorsement requirements, organizational roles and responsibilities, tasks and products, processes, and reviews to support a particular flight and/or increment.

In addition to the in-line functions performed by the various NASA and contractor SMA organizations, a policy-mandated alternate independent communications path for discussion of flight and ground safety issues and concerns exists through the Associate Administrator for Safety and Mission Assurance. The policy to provide an alternative communications path is met through the SMA PAR process.

SMA Flight Readiness Process:

The SMA PAR is held to assess and confirm satisfactory completion of all of the SMA activities necessary to provide an acceptable level of confidence in safety and mission success for a human space flight mission. The PAR provides the mechanism for all of the responsible SMA elements (NASA Center, contractor, in-line, independent assessment, Headquarters) to thoughtfully assess launch readiness status, open work, issues, and concerns, and then provide a consolidated HEDS SMA assessment of system readiness.

The PAR results in the participants demonstrating a complete understanding and acceptance of the integrated mission risks and provides the basis for the Associate Administrator for Safety and Mission Assurance and other SMA signatories to knowledgeably sign the Certificate of Flight Readiness. The PAR also results in the definition of topics to be addressed by the SMA representative in the FRR presentation.

To ascertain the integrated readiness of the entire SMA community, each active stakeholder must participate. International Partners may participate if they desire. PAR participants shall include, but are not limited to:

- Associate Administrator for Safety and Mission Assurance
- Enterprise Safety and Mission Assurance Division Flight Safety Managers
- HEDS Independent Safety and Mission Assurance Director

- HEDS Center SMA Directors
- KSC Safety, Health and Independent Assessment (SHIA) Director
- KSC Shuttle Processing SMA Division Manager
- KSC ISS/Payloads SMA Division Manager
- Chairperson, Space Flight Safety Panel
- ISS SMA Manager
- SSP SMA Manager
- SSP SR&QA Division Manager
- Prime and Major Element Contractors – SMA Manager
- Center SMA Organizations responsible for non-ISS Payloads involved with a Space Shuttle mission

The Associate Administrator for Safety and Mission Assurance chairs the PAR meeting. As a result of the PAR, an integrated SMA presentation using data reported by the projects at PAR's will be prepared by the SMA representative designated by the Associate Administrator for Safety and Mission Assurance. The SMA representative will present the SMA findings to the formal FRR board. The presentation will contain any CoFR exceptions and a readiness statement signed, as appropriate, by the Space Shuttle Program SMA Manager, ISS SMA Manager, Director, KSC Safety, Health and Independent Assessment Office, HEDS Center SMA Directors, Enterprise Safety and Mission Assurance Division, and the Director, HEDS Independent Safety and Mission Assurance Office.

During the PAR, each SMA stakeholder, i.e., contractor, NASA Center, in-line SMA function, and independent assessment function, is responsible for reporting on their performance of assigned responsibilities such as study and analysis results, independent technical assessments, validation efforts, audits, completion of required work, and surveillance of contractor efforts. As a result of their efforts, each organization shall submit significant evaluation activity listings, discussion items, and issues/concerns for the PAR. Each organization must demonstrate they have fulfilled program, Center, and Agency requirements and directives and identify shortfalls as exceptions.

The significant evaluation activity identified should be limited to those items that have been worked for the flight being assessed. Consideration for submittal should be based on problem criticality, safety severity, problems that have generic implications, and problems that will be discussed by the projects. As applicable, SMA stakeholders will also provide written one-page summaries and/or results of independent SMA assessments that have been conducted. This supplemental information is not presented at the PAR meetings.

Payloads will be assessed in the same manner as other flight hardware and will be reported on during the PAR process. The applicable NASA Center SMA organization will update the status of compliance with SMA requirements and, together with JSC/KSC Payload Safety Review Panels, provide updates or status of any unresolved issues/concerns and completion of the safety review process.

The applicable NASA Center SMA organization will provide a brief description of each NASA-developed payload and provide status of compliance to SMA requirements added beyond those of NSTS 1700.7B at the PAR meeting. In addition, KSC and JSC Payload Safety Review Panels will provide status of the safety review process, as defined in NSTS/ISS 13830, for non-NASA developed payloads (including private sector, foreign government, and non-classified DOD).

KSC provides status of payload processing through the KSC Payload Safety Review Panel review process. JSC and KSC Payload Safety Review Panels will identify any known payload issues related to the safety of the flight.

The JSC Payload Safety Review Panel provides generic statements related to the completion of the safety review process of DOD classified payloads.

SMA PAR Activities and Milestones

PAR meetings are scheduled to precede key program CoFR milestones. The HEDS SMA CoFR milestone reviews include the FRR and the Prelaunch Mission Management Team (PMMT) Review. The latest revision of NSTS 08117, "Procedure for Certification of Flight Readiness," contains detailed definitions of the Space Shuttle milestone reviews. SSP 50108, "Certificate of Flight Readiness Process Document," outlines ISS program reviews. Figure 2, "Prelaunch Assessment Review Milestones," defines the PAR activities relative to the ISS and Space Shuttle program CoFR milestones. In support of the PAR reviews, a teleconference is conducted weekly to discuss the PAR agenda, potential topics, issues, concerns to be presented during upcoming PAR reviews, and other factors related to the orderly conduct of the PAR. This telecon is referred to as the "PAR-5" meeting. The PAR is normally held less than one week prior to the Stage Operations Readiness Review (SORR) if it is a dedicated ISS flight or one week prior to FRR for a Space Shuttle mission. PAR tag-up meetings are held prior to the formal FRR and PMMT review meeting.

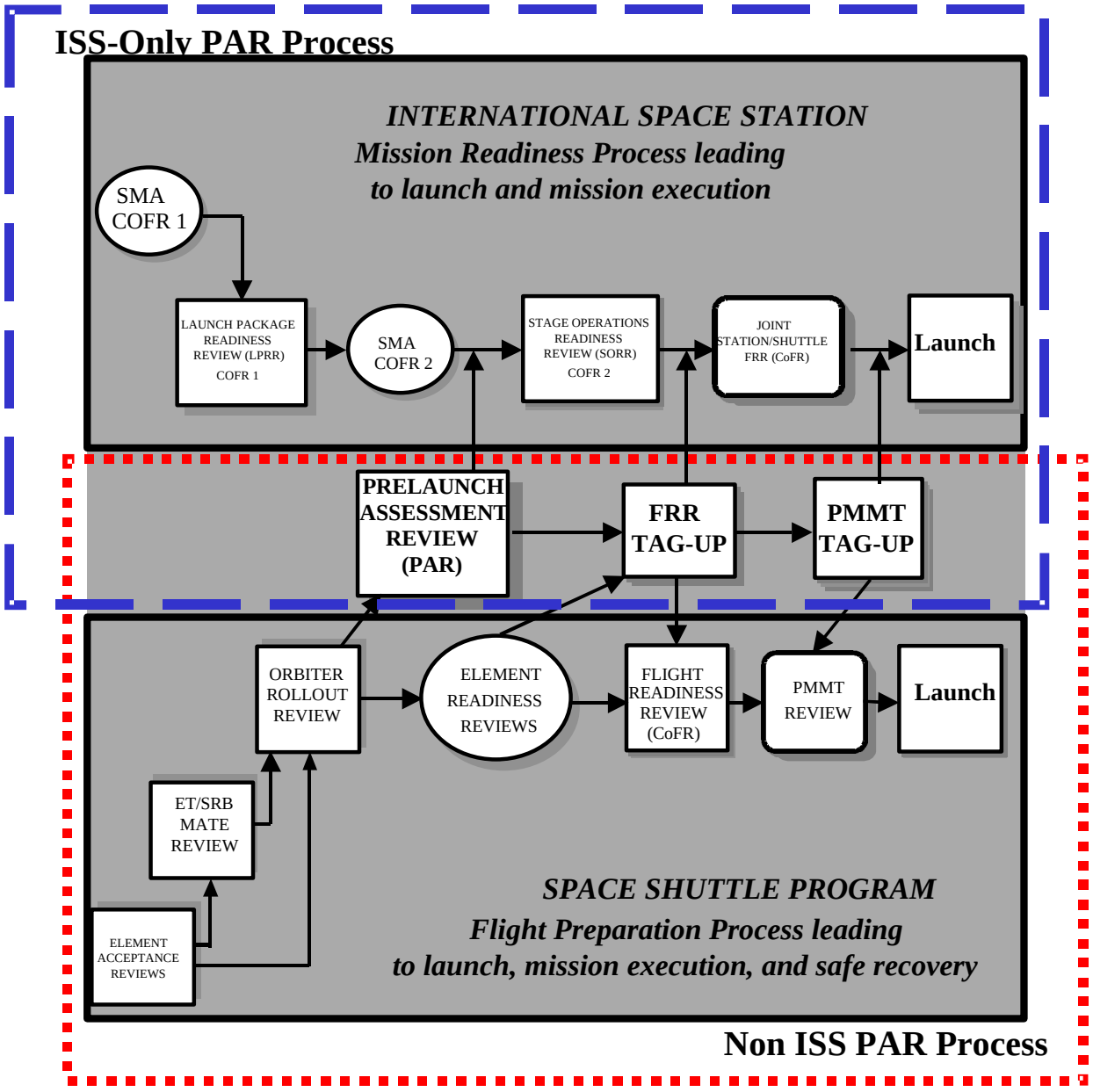

Figure 2. SMA Prelaunch Assessment Review Milestones

Data Reporting Elements and Definitions:

As a minimum the PAR shall contain the information found in Table 1. Items specific to the ISS program are identified in the Table.

Table 1: Data Reporting Elements

Data Reporting Element	Reporting Element Definition
Certification	• Summary of uncertified hardware with expected completion date. • Any area considered a potential constraint together with background and actions being taken.
Extra Vehicular Activity (EVA) Readiness	• Summary of the EVA activities including those to be performed by the Expedition crew. A description of any issues or concerns associated with performance of the EVA's.
Failure Modes Effects Analysis/Critical Item List (FMEA/CIL)	• Status of any open ISS FMEA's and the estimated date of closure. • A table that describes the background and acceptance rationale on any ISS CIL's. • Discussion of FMEA/CIL changes that represent any new Space Shuttle Criticality Category 1 failure modes or increased risk.
Government Surveillance	• A summary of work completed specific to the flight or mission under review that provides evidence of contractor compliance to program requirements.
Hardware Problem Reports (PR's) (Including In-Flight Anomaly (IFA) PR's)	• Any open hardware issues or unexplained anomalies, including background and description of actions being taken. • Any significant failures that may have occurred associated with the flight hardware that, if it would happen on-orbit, would threaten success of the mission or present a hazard. • Any in-flight anomalies from the ISS, including a description of the anomaly and the rationale for closure. • Any in-flight anomalies from previous Space Shuttle missions that may be considered to be constraints to flight, including description of actions being taken.

Hazard Analysis	• Status of any open ISS hazards and the estimated date of closure. • Status of Space Shuttle hazards that represent a unique risk or any new accepted risk hazards. • A table that describes the background and acceptance rationale on any ISS mission-related safety noncompliance. • A summary of any significant quantitative assessment results.
Independent Analysis	• A summary of the independent assessment activities, identifying any open issues, and including background and description of actions being taken. • A summary of assessments performed which address the long-term safety and mission success of the program.
Launch Commit Criteria (LCC)	• Any LCC changes considered to be potential constraints, including background and description of actions being taken.
Launch Package & On-Orbit Configuration Description & Status	• The configuration of each element to be launched, including the flight support equipment, payloads, Design Test Objective (DTO's), and cargo. • The configuration of the on-orbit vehicle before and after the mission, and the readiness status of the described items and the on-orbit configuration.
Lessons Learned Review	• Any applicable items from the ISS Lesson Learned Database that remain to be addressed, including background and description of actions being taken.
Limited Life Items	• Any limited life hardware that may be considered to be a constraint, including background and description of actions being taken. • An assessment of ISS limited life items to support ILC +30 days, and ILC +60 days.
Mission Overview	• A summary of the overall mission and the on-orbit operations to be performed • A summary of the ISS stage activities. • A description of the additional ISS functionality gained as a result of the mission.

Mission Success Criteria	• The mission objectives, science objectives, and mission success criteria (minimum and full) for the mission. An affirmative statement that risk acceptance decisions made for the mission will not adversely affect future mission success. • The ISS stage success criteria including mission and science objectives. • Any open issues and residual risks in meeting the mission objectives. • A summary of the planned contingencies for the ISS stage.
NASA Safety Reporting System (NSRS) Review	• Status of applicable open NSRS reports and identification of any that are considered to be potential constraints to flight. • Background and description of actions being taken. Note: Details of NSRS reports will not be discussed so as to protect the anonymity of the author.
One-Page Summaries	• A short summary of an issue, concern, or special topic (referred to hereafter as an issue) related to the flight, increment, or expedition under review. A one-page summary (one-pager) can be used to document an issue that is well understood, has been brought to closure, has little or no residual risk, can be easily explained, and has no controversy associated with closure. One-Pagers are used to document issues that were identified late in the assessment process and not covered in one of the other reporting areas (e.g., PR's, Non-Compliance Reports (NCR), etc).
Other Concerns	• Any other issue or concern not covered elsewhere which may represent a potential constraint, including background and description of actions being taken.
Significant Non-Conforming Parts and Materials	• Any open issues or potential constraints, including background and description of actions being taken.
Software PR's	• Any open software issues, software PR's, or unexplained anomalies, including background and description of actions being taken.
SMA Lifecycle Activities Overview	• An overview of the ISS SMA activities that were performed in support of the mission, integration into the on-orbit configuration, and the increment operations.

SMA Metrics Overview	• An overview of potential ISS risks for the on-orbit stage. • Discussion of any ISS subsystem or functional reliability problem areas. (On-orbit Stage Functional SMA Assessment.)
Suspect Condition Action Notice (SCAN)/Alerts	• Any open alerts considered to be potential constraints, including background and description of actions being taken.
Waivers/Deviations	• Waivers/deviations considered to be potential constraints, including background and description of actions being taken.

Mission Management Overview:

Following the formal FRR, the SMA community focuses its attention to the completion of the planned open work, proper closeout of any CoFR exceptions identified at the FRR, and any non-standard activities within their assigned area of responsibility. In preparation for launch, mission execution, and recovery, the MMT is activated at the PMMT Review to initially assess deltas to flight readiness since the FRR and to provide a go/no-go determination to continue the countdown. The Associate Administrator for Safety and Mission Assurance designates or approves the SMA MMT member for both the Space Shuttle launch countdown and for human space flight activities.

Space Shuttle Prelaunch MMT Activities:

Space Shuttle Prelaunch MMT membership is delineated in NSTS 07700, Volume VIII, Appendix D. With the activation of the MMT, the SMA MMT member becomes the focal point for the SMA community and is responsible for monitoring and, if requested, coordinating the evaluation of anomalies, issues, and concerns raised since the FRR. The SMA MMT member presents the Associate Administrator for Safety and Mission Assurance position on potential issues and concerns at the PMMT Review. After the PMMT Review, the SMA MMT member maintains contact with key SMA personnel designated to support the launch and mission execution through the Prelaunch Communications Network System, which is administered by the JSC Safety, Reliability, and Quality Assurance Office. During the terminal launch countdown (T-6 hours to launch), the SMA MMT member will present the SMA community position to the MMT Chairperson and will provide the OSMA go/no-go for launch at the T-9 minute MMT poll. The SMA MMT member bases the go/no-go for launch position on a poll taken of various NASA in-line SMA and independent assessment organizations. More importantly, the OSMA MMT membership provides an alternate independent path for the HEDS Center SMA organizations to communicate information and actions concerning safety, risks, and other SMA matters to the Associate Administrator for Safety and Mission Assurance (as required by NPD 8700.1, “NASA Safety and Mission Success”).

The SMA MMT member coordinates disposition of anomalies, issues, and concerns throughout the launch countdown and polls the following in-line SMA and independent assessment organizations to arrive at the SMA community go/no-go for launch:

Organization

1. KSC Shuttle Processing In-Line SMA
2. JSC In-Line SMA
3. MSFC In-Line SMA
4. KSC ISS/Payload Processing
5. HEDS Independent Safety and Mission Assurance
6. KSC Safety, Health and Independent Assessment (SHIA)
7. Manager, Space Shuttle Program SMA
8. Manager, ISS SMA
9. Enterprise Safety and Mission Assurance Division

Determination of the OSMA position on anomaly, issue, and concern resolution and the SMA MMT poll is conducted on the SRMQ communications loop (OIS Channel 6006), which is voice recorded throughout the countdown. Each organizational entity to be polled resides at the appropriate location to meet their individual responsibilities; all do not need to be at the launch site as long as two-way access to the SRMQ communications loop is available. Each HEDS SMA and independent assessment organization has assigned duties with their respective organizational entity and is responsible for supporting anomaly, issue, and concern resolution on their respective home organization OIS communications channel. Through this activity, each in-line SMA and independent assessment organization is responsible for communicating with their respective contractor SMA organizations during the countdown to determine the contractor SMA position on anomaly, issue, and concern resolution and their go/no-go for launch. The contractor SMA position is reflected in the NASA SMA community poll conducted by the SMA MMT member.

ISS MMT (IMMT) Activities

The ISS MMT roles, responsibilities, and membership are defined in ISS Partner Program Directive ISS-PPD-507, "Charter for the International Space Station Mission Management Team." The ISS SMA MMT member, as the OSMA designee, is the focal point for the SMA community and is responsible for coordinating the evaluation of anomalies, issues, and concerns associated with the orbiting ISS. The SMA IMMT member presents the results of SMA evaluations to the IMMT chairperson. The SMA IMMT member provides a single SMA go/no-go for any polling decisions made by the IMMT chair. The SMA IMMT member bases his/her decision on a poll of NASA SMA; ISS prime contractor SMA, ISS Mission Evaluation Room (MER) SMA support, and the HEDS Independent Safety and Mission Assurance organization.

Following launch and throughout the mission, the SMA MMT member (Space Shuttle and/or ISS) continues the SMA community coordination activities associated with evaluation of anomalies, issues, and concerns. The Space Shuttle SMA MMT member represents the OSMA and SMA community at the daily MMT telecon (joint MMT for ISS Missions) and provides the single SMA position as required. Issues identified during the

course of the mission are dealt with on a real-time basis and elevated to the appropriate level of SMA management as soon as practical. Upon notification, and at the discretion of the Associate Administrator for Safety and Mission Assurance, a meeting with the appropriate NASA and contractor SMA management is convened. The Enterprise Safety and Mission Assurance Division is the focal point for coordination of the meeting with the participants.

In the event of a contingency, the applicable Contingency Action Plans (CAP) are implemented. SSP 50190,"International Space Station Contingency Action Plan," details the reporting responsibility for ISS. Each CAP notification/reaction sequence includes notification of SMA personnel and OSMA. The Associate Administrator for Safety and Mission Assurance determines the manner of real-time support actions in the event of an Office of Space Flight probable or declared contingency. This determination will be made in concert with the "Office of Safety and Mission Assurance Space Flight Operations Contingency Action Plan."